

FIGURE 1 - PRIOR
ART PROPANE
RECOVERY

TABLE 1 - STREAM SUMMARY FOR FIGURE 1 PROPANE RECOVERY- PRIOR ART

| Stream Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|---------|---------|---------|---------|---------|---------|--------|--------|
| Temp., °F | 68 | 67 | -22 | -22 | -22 | -100 | -101 | -100 |
| Pressure, psig | 1300 | 1275 | 1268 | 1268 | 1268 | 449 | 447 | 470 |
| Flow, lbmol/hr | 109,805 | 109,805 | 109,805 | 109,805 | - | 109,805 | 20,796 | 20,796 |
| Stream Number | 9 | 10 | 11 | 12 | 13 | 14 | 17 | 18 |
| Temp., °F | -102 | 57 | -25 | 203 | -20 | -75 | -75 | -75 |
| Pressure, psig | 445 | 463 | 440 | 453 | 450 | 445 | 470 | 445 |
| Flow, lbmol/hr | 105,703 | 20,796 | 105,703 | 4,100 | 33,395 | 33,395 | 16,700 | 21,800 |
| Stream Number | 19 | 20 | 21 | 22 | 23 | | | |
| Temp., °F | -75 | 24 | 73 | 201 | 110 | | | |
| Pressure, psig | 445 | 433 | 600 | 1315 | 1300 | | | |
| Flow, lbmol/hr | 11,595 | 105,703 | 105,703 | 105,703 | 105,703 | | | |

Key Stream Component Flow (lbmol/hr)

| Stream Number | 1 | 7 | 9 | 12 | 13 | 16 | 17 | 23 |
|------------------------|--------|-----------|--------|-----------------|--------|----|-------|--------|
| CO2 | 1,647 | 608 | 1,647 | 0 | 1,446 | | 838 | 1,647 |
| N2 | 471 | 15 | 471 | 0 | 19 | | 3 | 471 |
| C1 | 97,044 | 11,907 | 97,043 | 0 | 19,095 | | 7,188 | 97,043 |
| C2 | 6,582 | 4,217 | 6,528 | 54 | 12,831 | | 8,667 | 6,528 |
| C3 | 2,988 | 2,976 | 13 | 2,975 | 5 | | 4 | 13 |
| IC4 | 327 | 327 | 0 | 327 | 0 | | 0 | 0 |
| NC4 | 488 | 488 | 0 | 488 | 0 | | 0 | 0 |
| IC5 | 125 | 125 | 0 | 125 | 0 | | 0 | 0 |
| NC5 | 124 | 124 | 0 | 124 | 0 | | 0 | 0 |
| NC6 | 9 | 9 | 0 | 9 | 0 | 0 | 0 | 0 |
| Recoveries: | | | | | | | | |
| Propane | | 99.5% | | | | | | |
| Butanes+ | | 100.0% | | | | | | |
| Residue Gas Compressor | | 43,000 HP | | 43.00 HP/MMscfd | | | | |

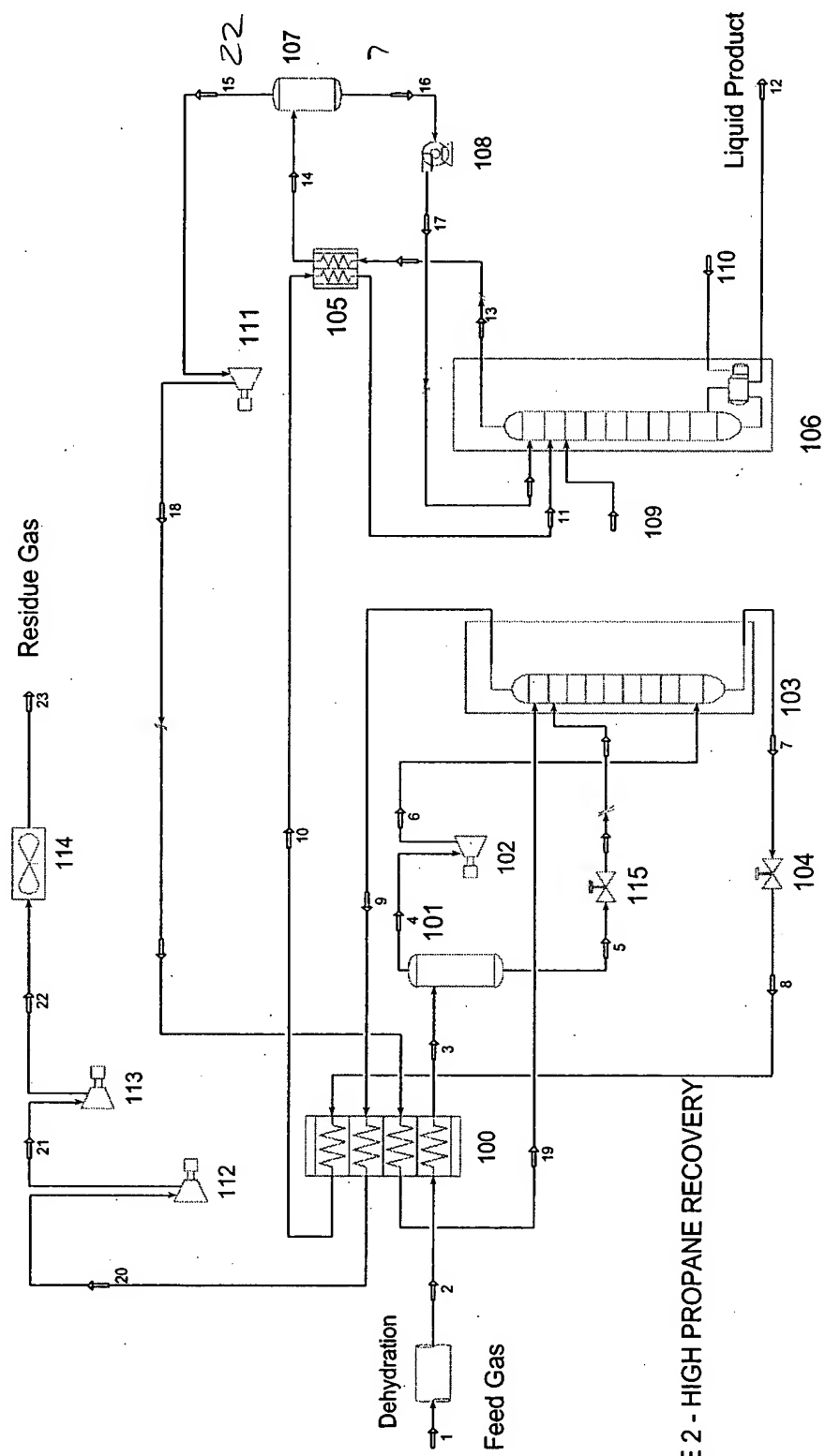


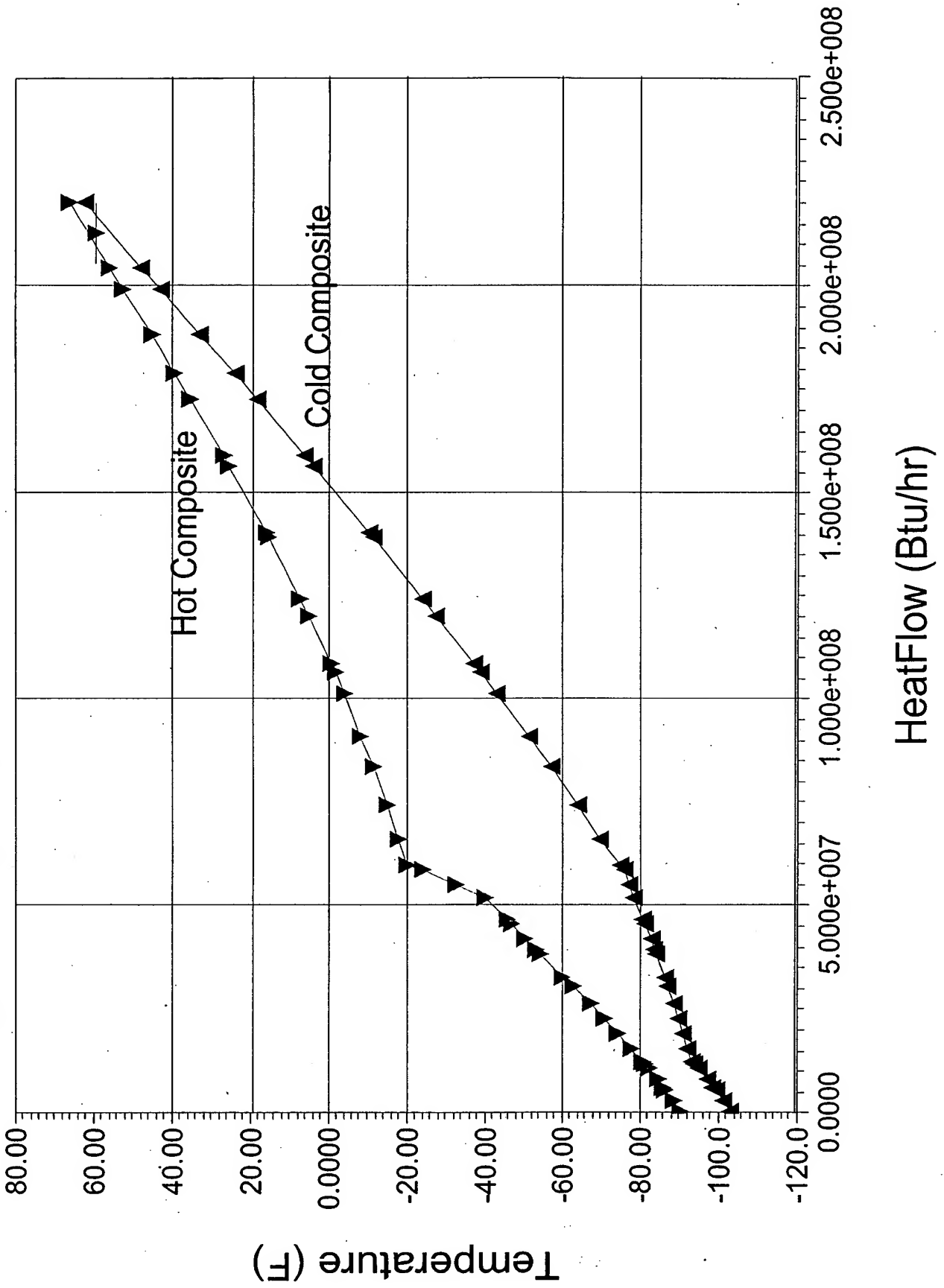
TABLE 2 - STREAM SUMMARY FOR FIGURE 2 - PROPANE RECOVERY

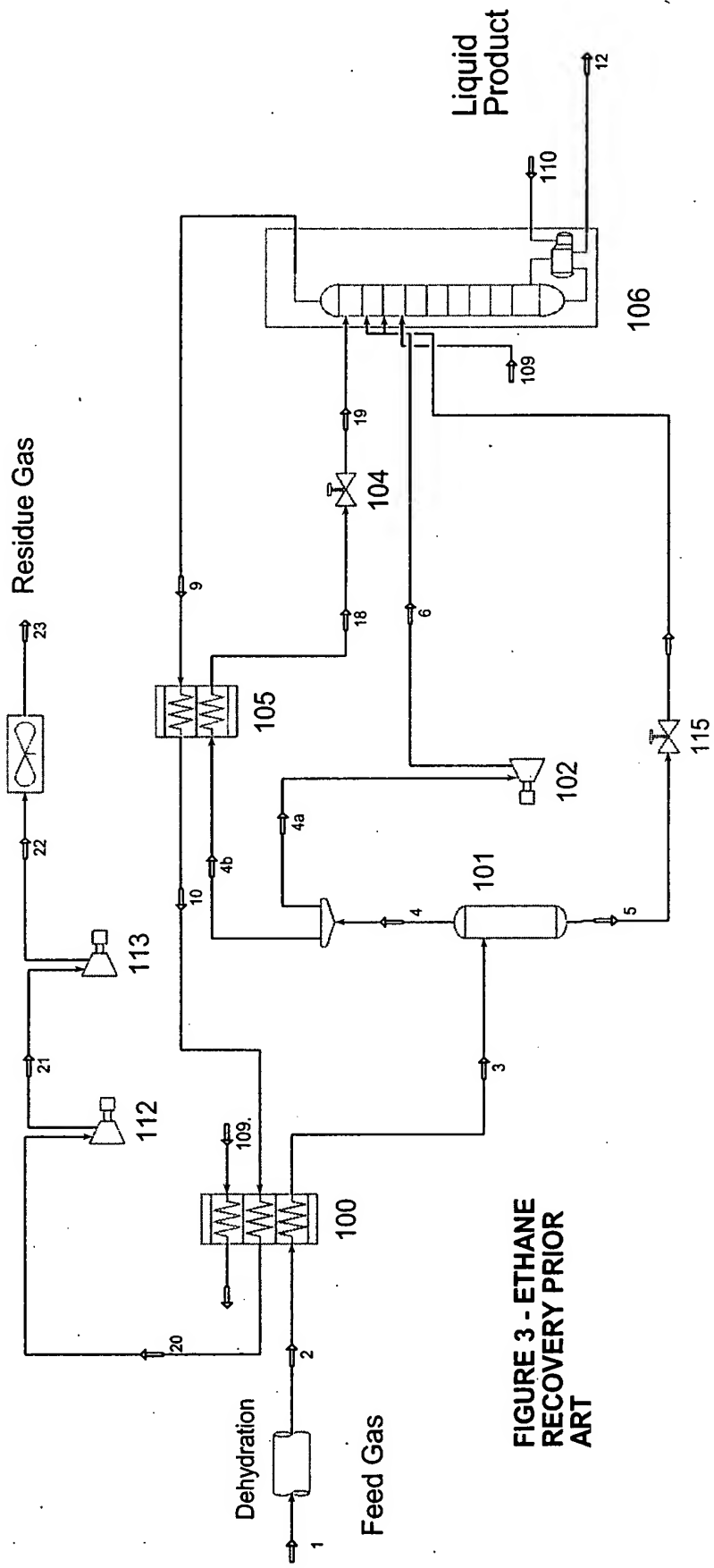
| Stream Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------|---------|---------|---------|---------|---------|---------|--------|--------|---------|
| Temp., °F | 68 | 67 | -20 | -20 | -20 | -81 | -85 | -103 | -93 |
| Pressure, psig | 1300 | 1275 | 1268 | 1268 | 1268 | 589 | 587 | 420 | 585 |
| Flow, lbmol/hr | 109,805 | 109,805 | 109,805 | 109,805 | 0 | 109,805 | 25,953 | 25,953 | 105,703 |
| Stream Number | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Temp., °F | -77 | -37 | 191 | -33 | -54 | -54 | -54 | -53 | -1 |
| Pressure, psig | 413 | 408 | 403 | 400 | 395 | 395 | 395 | 485 | 600 |
| Flow, lbmol/hr | 25,953 | 25,953 | 4,111 | 28,664 | 28,673 | 21,851 | 6,822 | 6,822 | 21,851 |
| Stream Number | 19 | 20 | 21 | 22 | 23 | | | | |
| Temp., °F | -90 | 62 | 98 | 197 | 110 | | | | |
| Pressure, psig | 593 | 575 | 724 | 1315 | 1300 | | | | |
| Flow, lbmol/hr | 21,851 | 105,703 | 105,703 | 105,703 | 105,703 | | | | |

Key Stream Component Flow (lbmol/hr)

| Stream Number | 1 | 7 | 9 | 12 | 13 | 16 | 17 | 23 |
|------------------------|--------|--------|--------|-------|-----------|-------|-------|--------|
| CO2 | 1,647 | 701 | 1,647 | 0 | 955 | 254 | 254 | 1,647 |
| N2 | 471 | 26 | 471 | 0 | 27 | 1 | 1 | 471 |
| C1 | 97,044 | 16,057 | 97,048 | 0 | 18,029 | 1,972 | 1,972 | 97,048 |
| C2 | 6,582 | 5,104 | 6,533 | 54 | 9,614 | 4,563 | 4,563 | 6,533 |
| C3 | 2,988 | 2,993 | 4 | 2,985 | 40 | 32 | 32 | 4 |
| IC4 | 327 | 327 | 0 | 327 | 0 | 0 | 0 | 0 |
| NC4 | 488 | 488 | 0 | 488 | 0 | 0 | 0 | 0 |
| IC5 | 125 | 125 | 0 | 125 | 0 | 0 | 0 | 0 |
| NC5 | 124 | 124 | 0 | 124 | 0 | 0 | 0 | 0 |
| NC6 | 9 | 9 | 0 | 9 | 0 | 0 | 0 | 0 |
| Recoveries: | | | | | | | | |
| Propane | | | 99.9% | | | | | |
| Butanes+ | | | 100.0% | | | | | |
| Residue Gas Compressor | | | 33,320 | HP | | | | |
| DeC2 Ovhd Compressor | | | 2,890 | | | | | |
| Total HP | | | 36,210 | | | | | |
| | | | | 36.21 | HP/MMscfd | | | |

Figure 2A - High Propane Recovery Composite Curve





**FIGURE 3 - ETHANE
RECOVERY PRIOR
ART**

TABLE 3 - STREAM SUMMARY FOR FIGURE 3 ETHANE RECOVERY- PRIOR ART

| | | | | | | | | |
|----------------|---------|---------|---------|---------|--------|--------|---------|---------|
| Stream Number | 1 | 2 | 3 | 4 | 4a | 4b | 5 | 6 |
| Temp., °F | 68 | 67 | 35 | 35 | 35 | 35 | 35 | -62 |
| Pressure, psig | 1300 | 1275 | 1268 | 1268 | 1268 | 1268 | 1268 | 429 |
| Flow, lbmol/hr | 109,805 | 109,805 | 109,805 | 109,805 | 64,236 | 45,569 | - | 64,236 |
| Stream Number | 9 | 10 | 12 | 16 | 18 | 19 | 20 | 21 |
| Temp., °F | -125 | 18 | 97 | 55 | -121 | -132 | 31 | 76 |
| Pressure, psig | 425 | 420 | 428 | 427 | 1263 | 429 | 415 | 558 |
| Flow, lbmol/hr | 100,496 | 100,496 | 9,309 | 22,201 | 45,569 | 45,569 | 100,496 | 100,496 |
| Stream Number | 22 | 23 | 109 | | | | | |
| Temp., °F | 220 | 110 | 32 | | | | | |
| Pressure, psig | 1315 | 1300 | 427 | | | | | |
| Flow, lbmol/hr | 100,496 | 100,496 | 22,201 | | | | | |

Key Stream Component Flow (lbmol/hr)

| | | | | |
|------------------------|--------|-----------|-------|-----------------|
| Stream Number | 1 | 9 | 12 | 23 |
| CO2 | 1,647 | 1,542 | 105 | 1,542 |
| N2 | 471 | 471 | 0 | 471 |
| C1 | 97,044 | 97,043 | 1 | 97,043 |
| C2 | 6,582 | 1,347 | 5,236 | 1,347 |
| C3 | 2,988 | 87 | 2,901 | 87 |
| IC4 | 327 | 3 | 324 | 3 |
| NC4 | 488 | 3 | 485 | 3 |
| IC5 | 125 | 0 | 124 | 0 |
| NC5 | 124 | 0 | 124 | 0 |
| NC6 | 9 | 0 | 9 | 0 |
| Recoveries: | | | | |
| Ethane | | 79.5% | | |
| Propane | | 97.1% | | |
| Butanes+ | | 99.4% | | |
| Residue Gas Compressor | | 46,230 HP | | 46.23 HP/MMscfd |
| CO2 In C2 | | 2.0% | | |

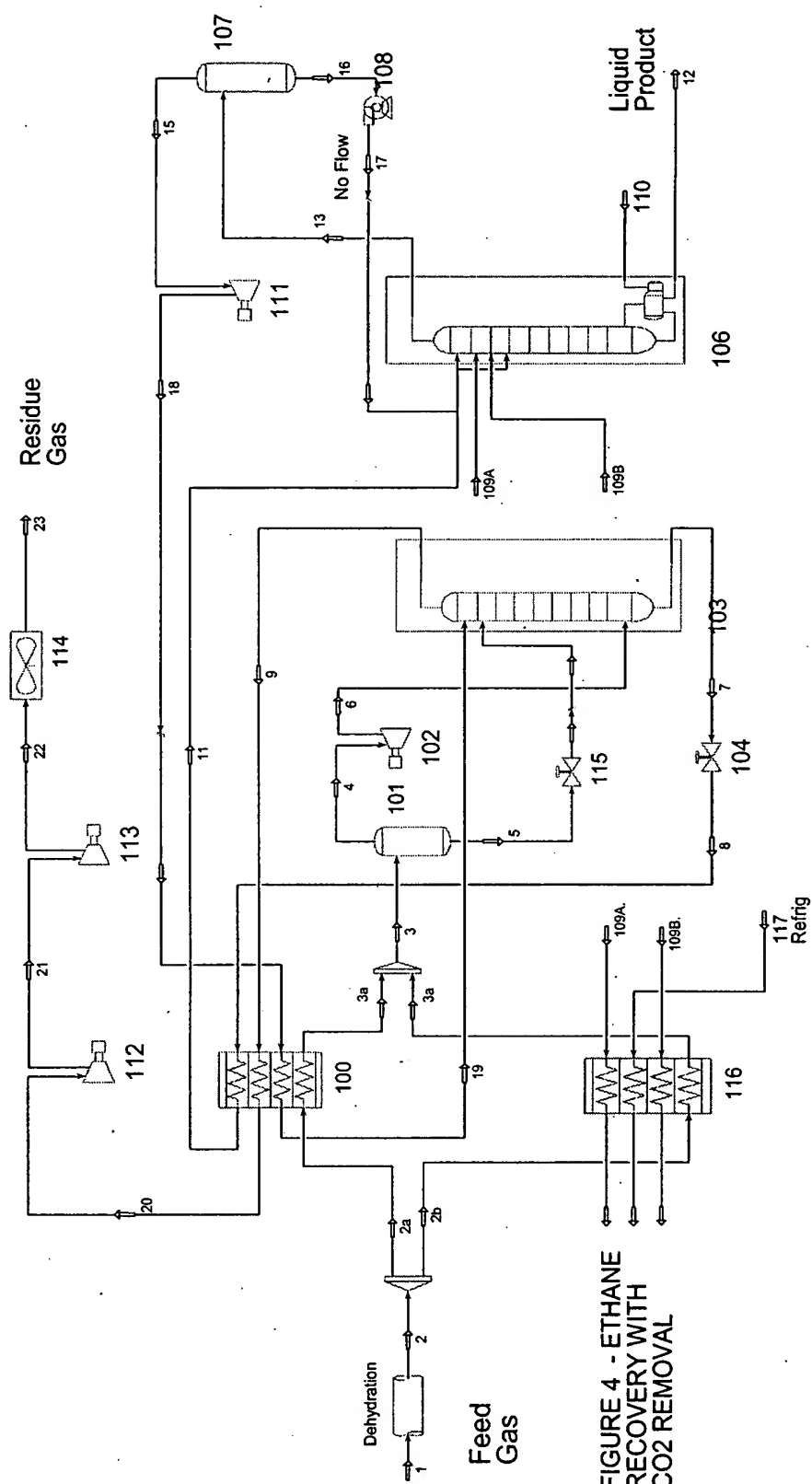


TABLE 4 - STREAM SUMMARY FOR FIGURE 4 ETHANE RECOVERY

| | | | | | | | | |
|----------------|---------|---------|---------|---------|---------|---------|--------|--------|
| Stream Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Temp., °F | 68 | 67 | -50 | -50 | -50 | -101 | -104 | -116 |
| Pressure, psig | 1300 | 1275 | 1268 | 1268 | 1268 | 589 | 587 | 475 |
| Flow, lbmol/hr | 109,805 | 109,805 | 109,805 | 109,805 | - | 109,805 | 66,995 | 66,995 |
| Stream Number | 9 | 11 | 12 | 13 | 15 | 16 | 17 | 18 |
| Temp., °F | -111 | -108 | 110 | -90 | -90 | -90 | -81 | -56 |
| Pressure, psig | 585 | 472 | 450 | 448 | 448 | 448 | 485 | 595 |
| Flow, lbmol/hr | 101,195 | 66,995 | 8,580 | 58,416 | 58,416 | - | - | 58,416 |
| Stream Number | 19 | 20 | 21 | 22 | 23 | 109A. | 109B. | 117 |
| Temp., °F | -111 | 62 | 87 | 198 | 110 | -27 | -89 | 6 |
| Pressure, psig | 588 | 575 | 675 | 1315 | 1300 | 449 | 458 | 28 |
| Flow, lbmol/hr | 58,386 | 101,195 | 101,195 | 101,195 | 101,195 | 21,550 | 33,597 | 4,105 |

Key Stream Component Flow (lbmol/hr)

| | | | | | | | | |
|------------------------|--------|--------|--------|--------|-------|--------|----|--------|
| Stream Number | 1 | 7 | 9 | 11 | 12 | 13 | 17 | 23 |
| CO2 | 1,647 | 1,723 | 1,644 | 1,723 | 2 | 1,720 | - | 1,644 |
| N2 | 471 | 117 | 471 | 117 | 0 | 117 | - | 471 |
| C1 | 97,044 | 53,038 | 97,016 | 53,038 | 0 | 53,038 | - | 97,016 |
| C2 | 6,582 | 7,870 | 2,013 | 7,870 | 4,568 | 3,302 | - | 2,013 |
| C3 | 2,988 | 3,162 | 50 | 3,162 | 2,938 | 224 | - | 50 |
| IC4 | 327 | 334 | 1 | 334 | 326 | 7 | - | 1 |
| NC4 | 488 | 494 | 1 | 494 | 487 | 7 | - | 1 |
| IC5 | 125 | 125 | 0 | 125 | 125 | 1 | - | 0 |
| NC5 | 124 | 124 | 0 | 124 | 124 | 0 | - | 0 |
| NC6 | 9 | 9 | 0 | 9 | 9 | 0 | - | 0 |
| Recoveries: | | | | | | | | |
| Ethane | | | | | | | | |
| Propane | | | | | | | | |
| Butanes+ | | | | | | | | |
| Residue Gas Compressor | | | | | | | | |
| DeC2 Ovhd Compressor | | | | | | | | |
| Refrigeration | | | | | | | | |
| Total HP | | | | | | | | |
| CO2 in Ethane | | | | | | | | |

| | |
|------------------------|-----------------|
| Ethane | 69.4% |
| Propane | 98.3% |
| Butanes+ | 99.9% |
| Residue Gas Compressor | 35,592 HP |
| DeC2 Ovhd Compressor | 4,489 |
| Refrigeration | 4,728 |
| Total HP | 44,809 |
| CO2 in Ethane | 500 ppm |
| | 44.81 HP/MMscfd |

Figure 4A - Ethane Recovery Composite Curve for Feed Exchanger 100

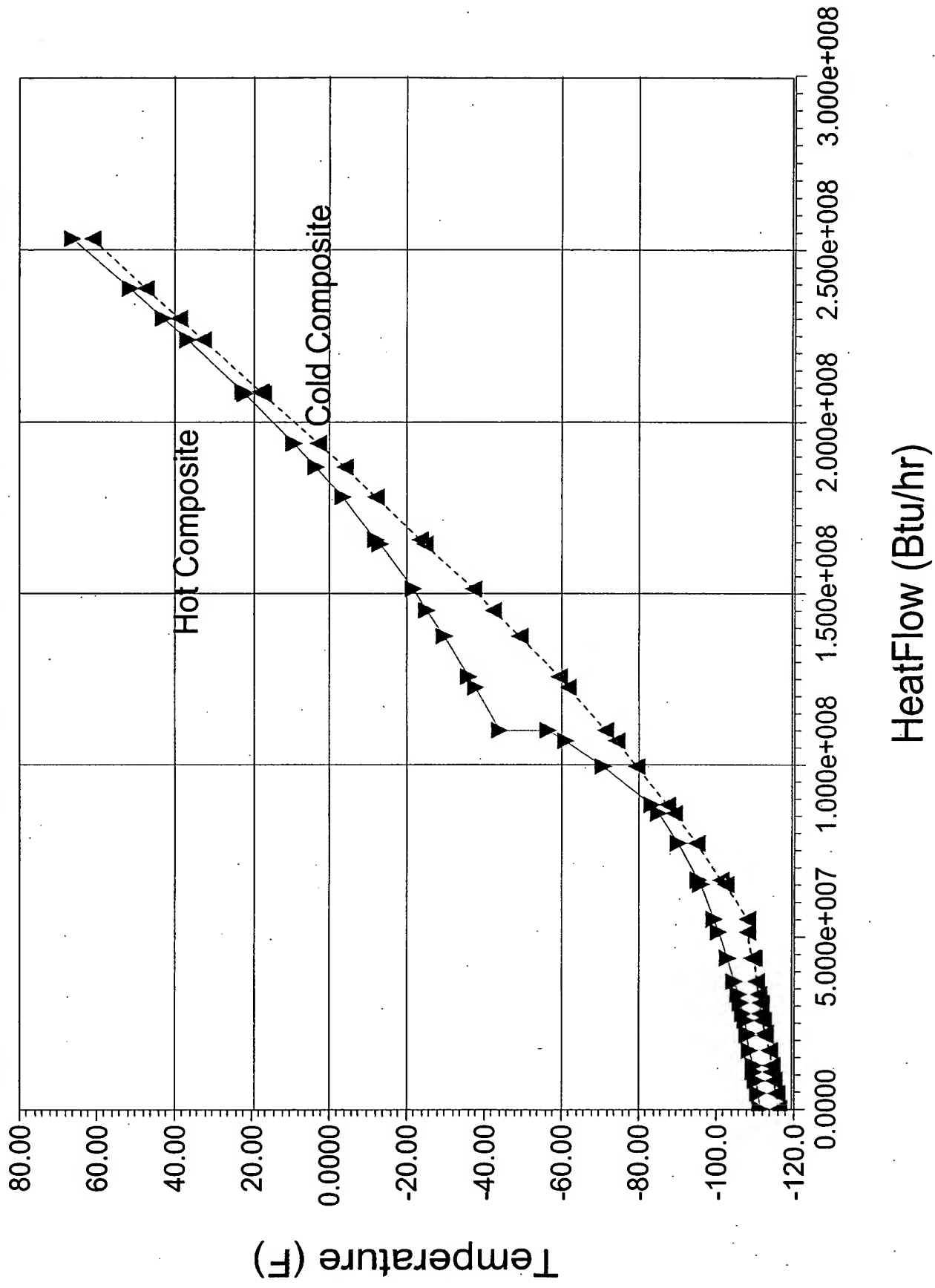
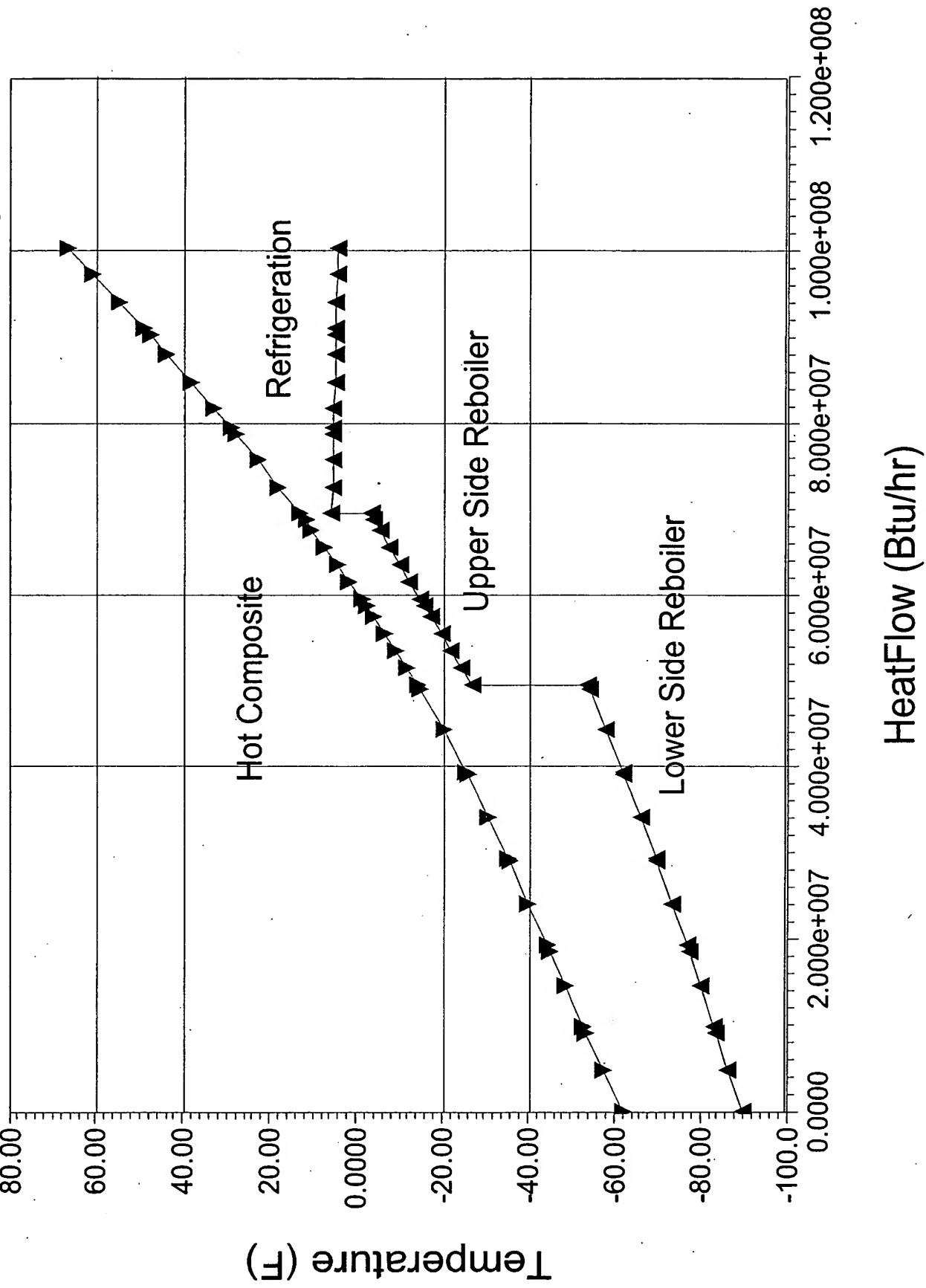


Figure 4B - Ethane Recovery Composite Curve for Side Exchanger 116



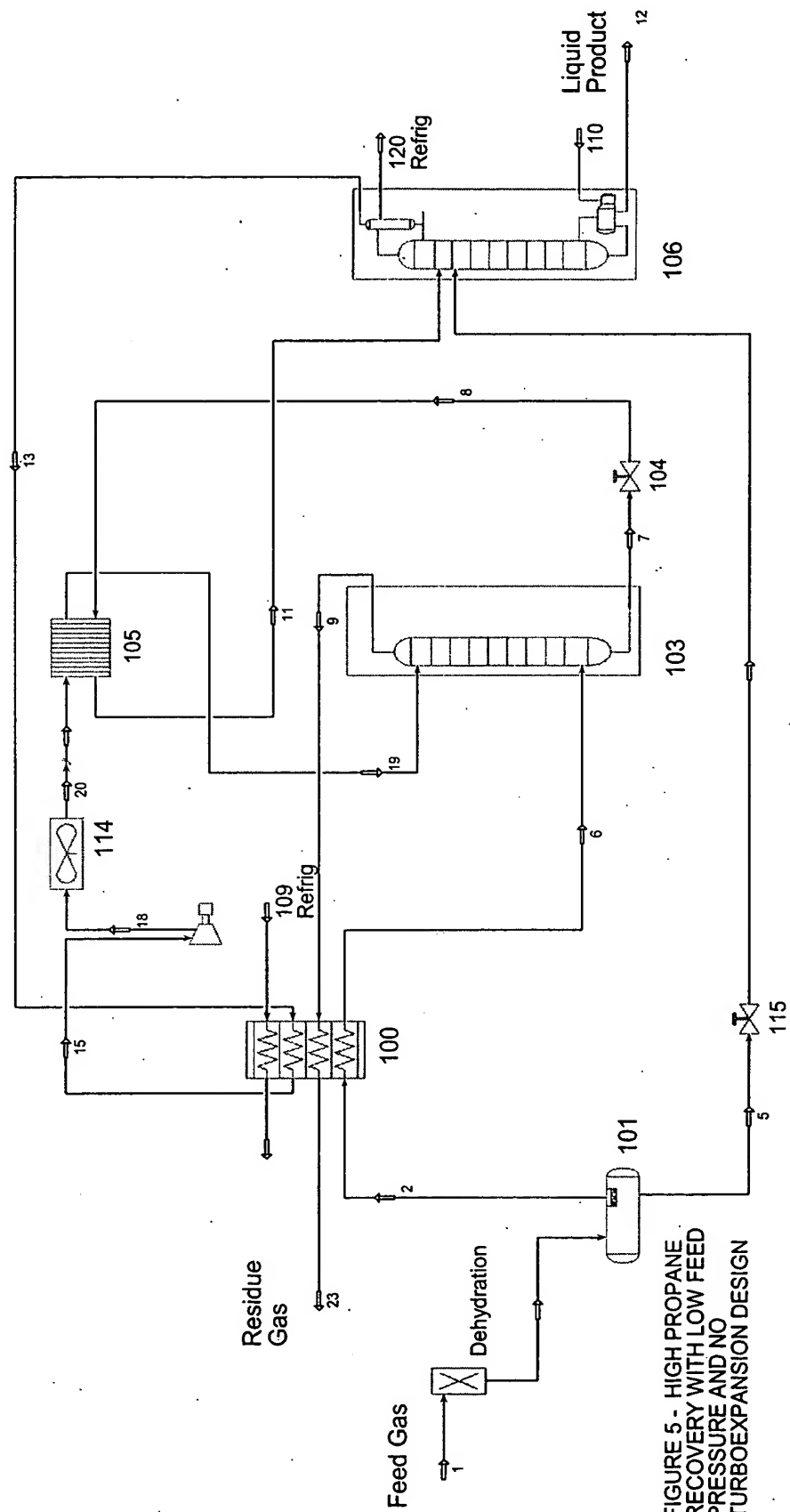


Table 5 - STREAM SUMMARY FOR FIGURE 5
HIGH PROPANE RECOVERY WITH LOW FEED PRESSURE AND NO TURBOEXPANSION

| | | | | | | | | |
|----------------|---------|---------|-------|---------|--------|--------|--------|--------|
| Stream Number | 1 | 2 | 5 | 6 | 7 | 8 | 9 | 11 |
| Temp., °F | 125 | 125 | 125 | -45 | -47 | -61 | -58 | 10 |
| Pressure, psig | 765 | 750 | 750 | 743 | 725 | 515 | 720 | 510 |
| Flow, lbmol/hr | 109,805 | 107,684 | 1,517 | 107,684 | 53,394 | 53,394 | 91,164 | 53,394 |

| | | | | | | | |
|----------------|--------|--------|--------|--------|--------|--------|--------|
| Stream Number | 12 | 13 | 15 | 18 | 19 | 20 | 23 |
| Temp., °F | 239 | -30 | 95 | 168 | -50 | 100 | 100 |
| Pressure, psig | 506 | 500 | 493 | 780 | 770 | 775 | 713 |
| Flow, lbmol/hr | 17,686 | 37,224 | 37,224 | 37,224 | 36,874 | 37,224 | 91,164 |

Key Stream Component Flow (lbmol/hr)

| | | | | | | | | |
|---------------|--------|--------|-------|--------|--------|--------|--------|--------|
| Stream Number | 1 | 2 | 5 | 7 | 9 | 12 | 13 | 23 |
| CO2 | 1,647 | 1,648 | 1,649 | 1,650 | 1,651 | 1,652 | 1,653 | 1,654 |
| N2 | 3,814 | 3,808 | 6 | 520 | 3,809 | 0 | 526 | 3,809 |
| C1 | 70,549 | 70,297 | 252 | 23,535 | 70,338 | 0 | 23,787 | 70,338 |
| C2 | 10,767 | 10,645 | 121 | 8,598 | 10,529 | 144 | 8,575 | 10,529 |
| C3 | 10,284 | 10,017 | 267 | 10,233 | 282 | 10,000 | 500 | 282 |
| IC4 | 2,002 | 1,908 | 94 | 1,908 | 0 | 2,002 | 0 | 0 |
| NC4 | 2,813 | 2,648 | 164 | 2,648 | 0 | 2,813 | 0 | 0 |
| IC5 | 829 | 744 | 85 | 744 | 0 | 829 | 0 | 0 |
| NC5 | 656 | 576 | 79 | 576 | 0 | 656 | 0 | 0 |
| NC6+ | 1,242 | 834 | 408 | 834 | 0 | 1,242 | 0 | 0 |

Recoveries:
Propane 97.2%
Butanes+ 100.0%

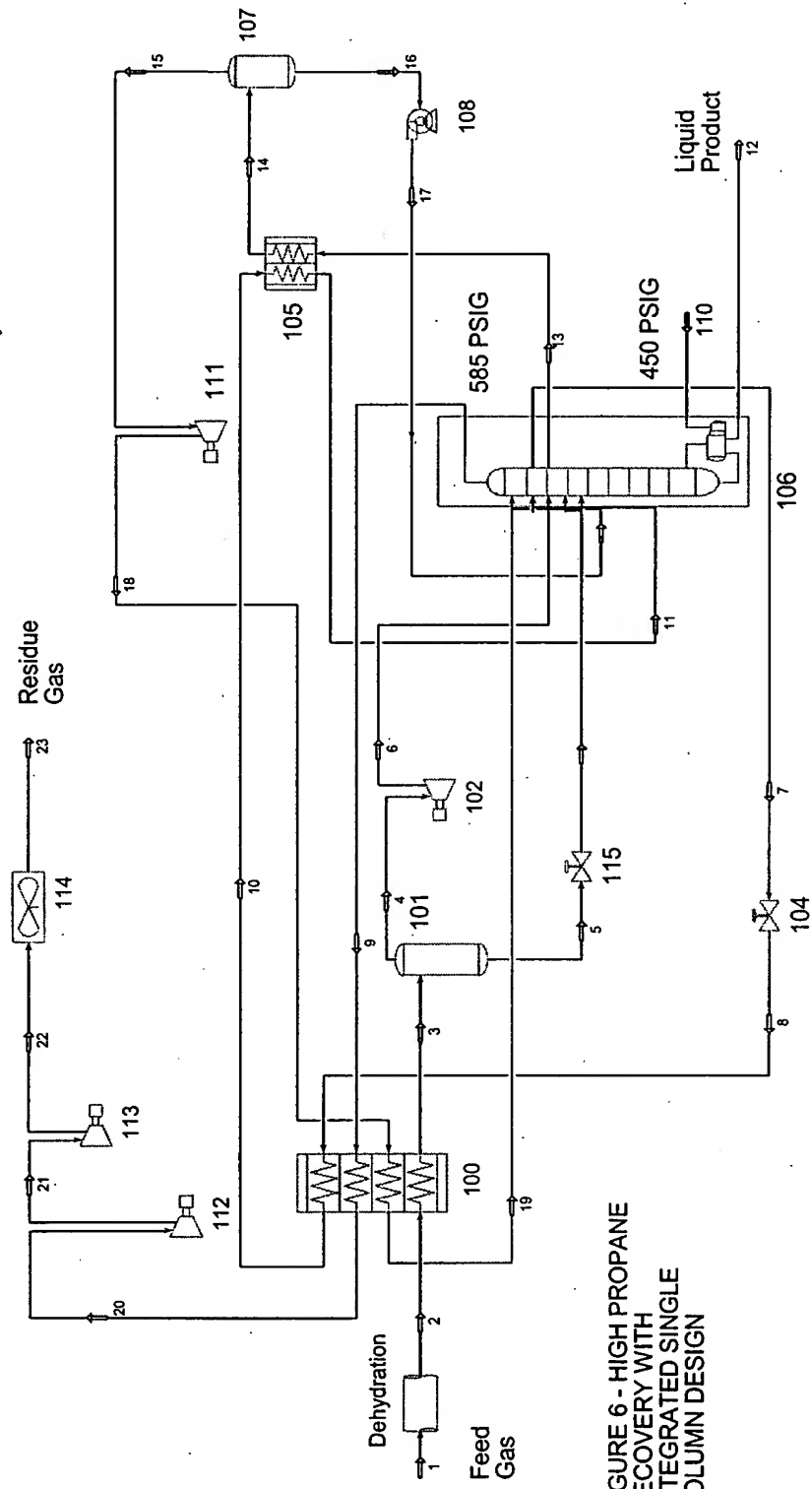


FIGURE 6 - HIGH PROPANE
RECOVERY WITH
INTEGRATED SINGLE
COLUMN DESIGN